

THE REGIONAL STRUCTURE OF POLAND: A STUDY BY FACTOR ANALYSIS

ZBYSZKO CHOJNICKI AND TERESA CZYŻ

ABSTRACT. The delimitation of the regional structure of Poland is considered by means of factor analysis and a grouping algorithm. Parallel methodologies for the analysis of uniform and functional regions have been developed. The pattern of homogeneous regions is based on discovering the fundamental dimensions of socio-economic space. There are three alternative approaches for using the factor analysis of the commodity flow matrix to derive the functional regions of Poland. Changes in this hierarchical structure over eight years are noted. This study confirms the hypothesis that Poland is in fact one strongly integrated region.

Introduction

Fundamental to the organization of subnational economic planning in Poland is a more detailed understanding of socio-economic space, the concept of region and regional structure. Thus, geographers have been a continuing interest in the nature of regions, but in recent years particular attention has been given to the development of precise methods for delimiting regions. This paper falls within the second problem of regional investigation. Consideration will be focused on how areal units form or link into regions rather than on a final grouping pattern. Our interest here is more concerned with a comprehensive analysis of the entire spatial economy than with specific sectors or branches. Polish scholars in the past have used the regional concept in different ways, largely due to the ambiguity of the concept of region. The region can mean an areal unit or administrative division or it can be a generalization or synthesis of areal features. More serious

questions have arisen regarding the role of different spatial patterns as a criterion in defining the system of regions. The difficulty of the delimitation of the complete and unique regions is due to the high degree of overlapping in actual reality of various regional patterns treated as corresponding. To overcome these typological and methodological difficulties, the concept of regional structure covering all economic regions of the various sizes, character and interrelations was introduced by K. Dzierwoński and A. Wróbel (1964). They consider that "in consequence of the growing territorial division of labour the additional pattern of functional interconnections is superposed on the spatial differentiation of local economy; these two systems of patterns mutually condition each other and together form the regional structure of socio-economic life". In the analyses which follow and in which we demonstrate the regionalization of Poland emphasis is placed on problems of the structural interdependence of the economy.

Fundamental in the procedure of this formulation and the explanation of the regularities in the spatial occurrence of economic processes is the concept of socio-economic space. The ontological approach conceives of the socio-economic space as a mode of existence of economic processes, whereas mathematical and economic-geographical criteria tend to treat socio-economic space as a set, or subset of geographical objects of specific interdependencies. In view of these

two approaches, the study of Poland's socio-economic space consists in analyzing the properties of set of objects and their interdependencies. Thus conceived the analysis of the socio-economic space is closely linked to the study of the regional structure of Poland. Two strategies may be used to delimit regional structure: first — a formal description of the properties of the areas which leads to their classification into relatively homogeneous regions; second — a functional description of the interrelations among objects which concludes in the identification of groups of highly connected areas, that is, functional regions. With the exception of B.J.L. Berry's work (1966) on spatial field theory uniform and functional regionalization have been treated separately. Our concern here is toward to develop parallel methodologies for the analysis of the regional structure of Poland. We assume that each of the concepts of region describes the different aspects of socio-economic reality. The uniform regions correspond to the distribution systems as opposed to functional regions which correspond to the system of connections. One of the obstacles to a detailed and comprehensive research of the integrated regional structure of Poland is lack of data. The data are so aggregated that they are not suitable for an application of statistical methods of integration of complex geographical patterns (for example: canonical correlation).

Uniform regions

A synthetic presentation of the economic regional structure of Poland from the point of view of its uniformity is based on the concept of the latent structure of socio-economic space (T. Czyż, 1970). The overall socio-economic space may be viewed as a set of partial socio-economic spaces com-

prised of different features (demographic, industrial, agricultural, transportation, services) of socio-economic life. In spite of its plurality, this set is finite. The partial socio-economic spaces, though containing different socio-economic phenomena, refer to the same reality in that they are reflections of some of its different aspects — they are interdependent, though clearly non-identical. The overall socio-economic space is a resultant of all partial spaces that together constitute its latent structure.

Factor analysis is a method of identifying the latent structure of the overall socio-economic space of Poland. A fundamental postulate of factor analysis is that there is a set of latent factors which must necessarily occur if the interdependencies between observable features of phenomena are to be explained. In applying the model of latent structure we attempt to divide the set into subsets having a common latent factor. The relationships between the variables result exclusively from the occurrence of the latent factor. The particular observable features are indexes for all possible values of the latent factor. Thus, factor analysis provides new possibilities with regard to the identification of latent phenomena. It is a model for measurements insofar as the identification of a directly unobservable factor is concerned. The factors are latent, that is, directly unobservable variables. The factorial model belongs therefore to the class of latent structures. The identification of the factors is of decisive importance to an adequate description of reality.

The data base for the regional analysis of Poland contains thirty-three variables representing the population, industrial and agricultural output, and services in 1965 (see T. Czyż 1971). Socio-economic phenomena have a definite location within the modified administrative division consisting of a total

324 areal units at the level of "powiat". The adopted frame of the phenomena corresponds in reality to the administrative division which is closely connected with the pattern of the spatial organization of economic activity.

It will be immediately clear that the validity of the results obtained is largely dependent on the quality of the available information. From the standpoint of the aims of this study, the statistical data at hand unfortunately fail to represent all the essential properties of the socio-economic space and, besides being based on relatively large spatial units (the poviats), they furnish an all too generalized picture. The factor analysis made by the principal factor method with Hotelling's iteration algorithm leads to an identification of three significant common factors accounting for 66.13% the communality. The program for factor analysis written in the Gier-Algol language employed the principal method on a Gier computer. The identified factors represent the fundamental dimensions of the 33-variable socio-economic space. These theoretical metafeatures are linked with definite clusters of observable variables. The nature of the factor must be inferred from the contents of these features. Since the factors are bipolar, they express a property that may have either a positive or negative score.

We now present a more specific discussion of the separate factors. The first factor accounts for the largest proportion of the common variance (38.33%). Its structure, in terms of features correlated positively with this factor, is composed of the following elements: (1) urban and non-agricultural population, (2) industrial activity, (3) transport, (4) services. Thus, this factor contains an assembly of fundamental features which are indicators of urbanization and industrialization. The criterion of urban population and, as a corrective, that of the percentage

of non-agricultural employment, are in Polish conditions the fundamental indicators of the urbanization level.

Factor I also contains "pure" indexes of industrialization: industrial employment, total industrial output, the value of fixed assets, investments, and the level of transportation development. It must be pointed out that the aggregation of the observable features of urbanization and industrialization into the category of Factor I is fully justified due to existence of different feedbacks between these two processes. Factor I is identified as the factor of the level of urbanization and industrialization. Urbanization and industrialization are elements of a more general process of modernization. The identification of the syndrome of modernization may thus be of some use for the determination of the level of the country's economic development.

Factor II explains 15.9% of the communality and reveals the second pattern of the linkage of variables. This factor exhibits positive correlation with the features: agricultural population per 100 hectares of agricultural land, economically active population, and population per establishment of socialized retail trade. It is striking that the agricultural population density is in strict positive correlation with the economically active population. This is due to the imprecision of the population's activity coefficient, caused by the application of a specific principle in distinguishing the active population. Polish statistics include among the working population women living in rural areas and thus the number of economically active people in agricultural areas is overestimated. Thus it can be said that the feature "agricultural population density" is a leading variable of this pattern. Factor II is thus the human factor in agriculture.

Factor III is similar to Factor II as far as

the percentage of the common variation explained (11.9) is concerned. The interpretation of Factor III is based on its positive correlation with some measures of agricultural intensity of productivity such as the percentage of agricultural land, the share of intensive crops in the total cultivated area, the density of livestock, and yields of wheat per capita. Factor III is identified as the factor of the level of intensity in the agricultural economy.

As expressed in terms of factors, the fundamental information on the basis socio-economic situation in Poland is contained in a matrix of factor scores of the type 324×3 .

The presentation of the morphology of the respective factor spaces is begun with the human factor in agriculture, which, although on a lower level in the factor hierarchy, has a conspicuous regional character.

A preliminary comparison of the spatial distribution of Factor II with that of the socialized farms of agriculture shows that the distribution of agricultural population is to a considerable extent the reverse of the distribution of socialized farms. Thus, by virtue of two value classes of Factor II (positive and negative) two types of area may be distinguished. The first type are areas of normal or relatively insufficient saturation with agricultural population and predominantly of socialized farms. The second opposite type indicates areas of a high density of agricultural population and private farms.

An analysis of the distribution of these types leads to a division of Poland into two large, distinctly delineated regional units which are fundamentally opposed to each other in the specific social structures of their agriculture. The Region of Western and Northern Poland is marked by a density of agricultural population below the national average, a well-developed socialization of

agriculture, and a predominance of middle-sized and large farms in the private sector. This Region is highly homogeneous in terms of the space under discussion. The Region of Central and Eastern Poland with surplus agricultural population and a conspicuous predominance of small private farms exhibits less homogeneity. The southeastern part of this Region, the southwestern part and a few enclaves together represent the opposite type.

The economic space of social forms of ownership can be regarded as a frame of reference for the economic activities in agriculture, i.e. the space of Factor III.

An examination of the geographical distribution of Factor III reveals a high heterogeneity of the space at the level of intensity of agriculture. The spatial pattern of the types of agriculture constitutes a mosaic structure. The particular types of agricultural intensity interlace with each other in space yielding a fairly complex picture. Only after a generalization of the patterns of agricultural types effected by joining related "positive" or "negative" types into contiguous territorial units can the delineation of two zones of highly intensive agriculture be achieved. The first of these zones constitutes the axis of the space under discussion here; it runs from the southwest to the north. This zone has a distorted and reveals several sections, namely the Silesian district, the Great Poland district, the East-Pomeranian district, with its extensions into Kujawy and the Łódź—Warszawa area. The second zone, in southern Poland, which extends roughly parallel from west to east is much weaker in its delimitation. The interzonal area, as well as those on the outer margin of the distinct zones, generally exhibit a low intensity of agriculture, below the national average. By synthesizing the space of the level of intensive agriculture with its background of the social

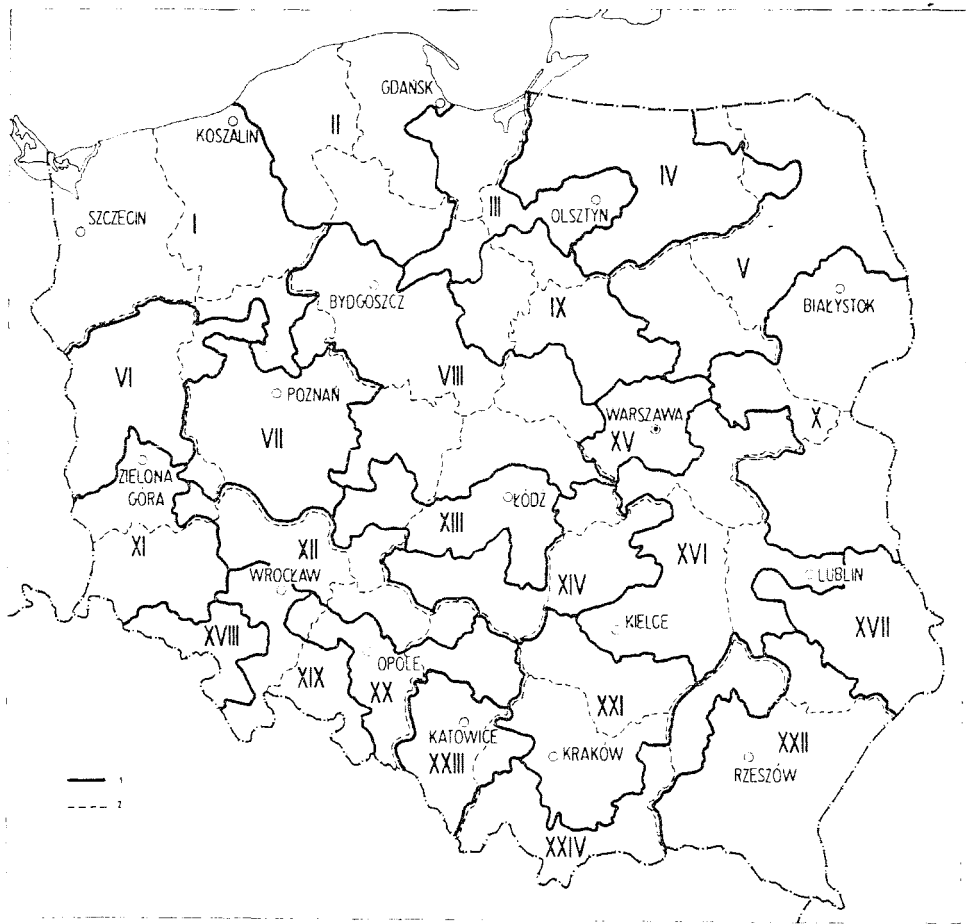


Fig. 1. The uniform regions of Poland, 1965.

- 1 — region boundaries
- 2 — voivodship boundaries

forms of ownership in agriculture, we obtain a resultant configuration of the integrated space representing the vertical and horizontal relations of the components.

The geographical picture of this type of pattern is marked by the occurrence of types without spatial contiguity. The original morphology of the space-basis of a strongly regional character has been distorted.

It can be generally stated that differentiation of agricultural space has, on the one hand, its historically-conditioned demogra-

phic reasons, and on the other, its physio-graphical justification.

In addition, the pattern of the level of urbanization and industrialization is superimposed upon the spatial differentiation of the agricultural economy. The specific character of the industrial-urban pattern consists in the extreme non-contiguity of the space of urbanization and industrialization.

Areas of the industrial-urban type of development are scattered throughout areas, especially in the eastern part of the country.

The western part of Poland has a well developed industrial zone which, however, is not homogeneous. First of all, within that zone the Upper Silesian area with a very high level of urbanization and industrialization may be distinguished.

This analysis of the spatial structure of Poland indicates three factors determining the spatial patterns representative of the overall socio-economic situation of Poland (Z. Chojnicki, T. Czyż 1972a). The spatial pattern created by the first factor, which is interpreted as the pattern of urbanization and industrialization, exhibits the formation of regional groupings of the semi-urban type that is represented by metropolitan and urban areas as well as by industrialized areas within areas of actively developing agriculture. This factor furnishes essential data for the appraisal of the level of socio-economic development. At the same time, it discloses the specific properties of the urban economy and allows the determination of the position of an area within an urban-rural continuum. This factor pattern can therefore be treated as a classifying category in the study of urban-rural duality. The high position of some poviats in the scale of industrialization and urbanization is a manifestation of urban economy.

The other two patterns of the socio-economic space, viz. the human factor in agriculture and the factor of the level of intensity of agriculture, do not represent definite stages of development in the socio-economic continuum. Thus they do not enable us to establish the position of an area in the lower part of the evolutionary chain of economic structures. Consequently, they are useless for the identification of type of rural economy, for they do not refer to the differentiation of rurality. On the other hand, Factor II and Factor III constitute component elements of the space of agricultural pheno-

mena. They effect the stratification of the spatial structure of agriculture in its horizontal aspects.

An analysis of the spatial distribution of the previous factors shows that the elementary structure of Polish space is principally typological rather than regional in character. The attempt to integrate the patterns gradually by methods of similarity estimation (taxonomic distance) and by graph grouping in factor systems makes possible a final delimitation of twenty-four uniform regions of Poland (Fig. 1). The uniform regions of Poland could not be strictly considered "homogeneous". These regions with a different degree of within-group homogeneity as a spatially coherent area contain enclave units belonging to other types, for example metropolitan areas. It must be observed that the appearance of these "cores" in a uniform area lead into the distribution system the element of nodality.

Functional regional structure over time

Considerable information about the functional regional structure of Poland may be learned from an analysis of commodity flows. The phenomenon of commodity flows as a measure of inter-regional connections is substantiated by the fact that such flows reveal the magnitude of goods exchanged which, in turn, expresses a geographical division of labor seen in the specialization and complexity of individual economic regions.

In this manner the picture of the distribution pattern is completed of the interactions in space. These interactions are reflected by system of connections which represent functional wholes as elements of the economic regional structure.

In this sector of the research area particular attention will be given to the use of the factor analysis for problems of reducing

sets of inter-regional flows into basic patterns of flow components and for the determination of functional regions. A second strategy is an analysis of changes of commodity flows over time. The aim of analysis of changes over time is the definition of the dynamics of functional regional structure whose development is not a linear function of the urbanization and industrialization processes underlying the basis for forming the spatial structure only. The significant thing here is the changes of the intensity and kinds of commodity flows.

The study of the structural changes of economic regions in Poland is based on railroad commodity flows during the period 1958 - 1966 (see: Z. Chojnicki, T. Czyż 1972b, 1973). The railroad transport in Poland plays a major role in the inter-regional exchange of goods. In Poland the railways share the largest part of the total freight tonnage moved (82,1%) and of all transportation movements (95,3%). This justifies to a high degree the representative character of railway transport as an indicator of commodity flows.

Data from the official state statistics of commodity flows by railways between seventeen voivodships in 1958 and 1966 served as the starting-point. These data are published in the form of matrices, the volume of the flows being recorded in physical units of measure, i.e., in tons. However, there are obvious limitations to the scope of the conclusions and estimates resulting from the regional implications of the physical volume of commodity flows. Thus, those data on the physical of the flows have been processed so as to achieve also their estimated value size. A comparison of railway freight flows on the inter-regional scale does show the existence of basic regional contrasts, which from the point of view of regional analysis possesses fundamental significance; they per-

mit one to grasp the chief inequalities in the distribution of the output of raw materials and mass products, and they reflect the major elements of the geographical division of labor.

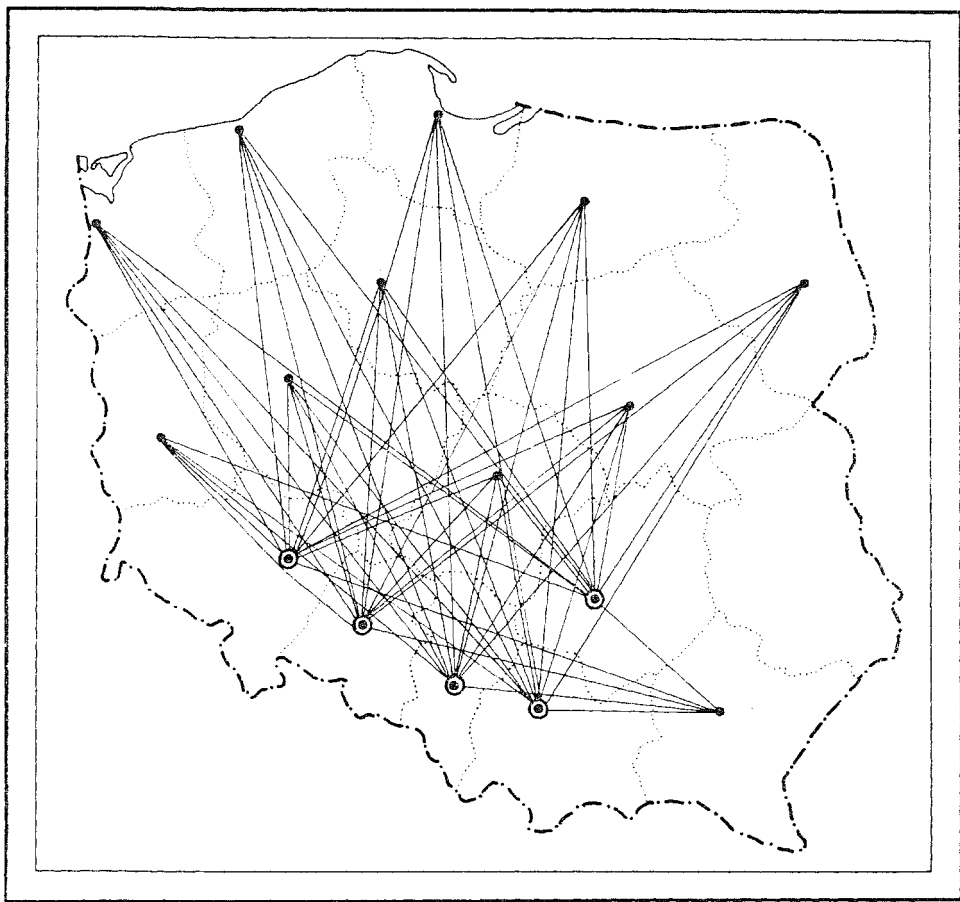
The definition of Poland's regional structure on the basis of the statistical material characterized above is limited to the existing voivodship framework. There is no possibility of achieving a correction of this division, and, as a result, one can only approximate reality.

Recognition of this fact limits the investigation of regional structure to the voivodship as a basic element thereby establishing the administrative-economic units as the economic regions. It must be emphasized that the degree to which such an analysis is adequate is closely defined by the suitability of this initial system; only to that extent can one accept this analysis of the regional economic structure of the country.

There are three alternative approaches for using factor analysis to derive groupings that are treated as functional regions of Poland.

The first approach starts with an origin-destination flow commodity matrix. This is transformed into a correlation matrix, which is then factor analyzed by using R and M techniques. The grouping that results from R-mode analysis reflects the degree to which voivodships (places) have similar origins in their flow patterns. Using this approach we employ the method of grouping into functional regions those places with high factor loadings on a given factor and those with factor scores on the same factor. This set of places represents destinations with common origins.

The next step of this study is an analysis of structural variations of the regions through an analysis of the evolution of common factor during the period 1958 - 1966 (M technique).



○ 1 • 2 ⊙ 3

Fig. 2. First-order regional pattern of Poland, 1958.

- 1 – origin
- 2 – destination
- 3 – origin and destination

The result of factor analysis for the “total” groups in terms of tonnage gives sequence of regional structure through two periods. (Fig. 2–3). The time course is characterized by a very high dominance of the first-order pattern, which explains 91,87% of common variance in 1958 and 61,88% in 1966. This pattern, which was developed very intensively in categories of number of interactions, is compact spatially. In 1958 the first-order pattern contains the destination set, cover-

ing nearly the whole of Poland (only without Lublin) connected with the origin cluster of the Katowice, Wrocław, Kraków, Opole and Kielce voivodship. In eight years the picture changed somewhat: the origin cluster has been reduced in the number of voivodships (without Kielce, Opole). The interaction space defined in value size of commodity flows during the period 1958 - 1966 shows a bipolar structure. The first-order pattern explains, on an average, 50% of the common

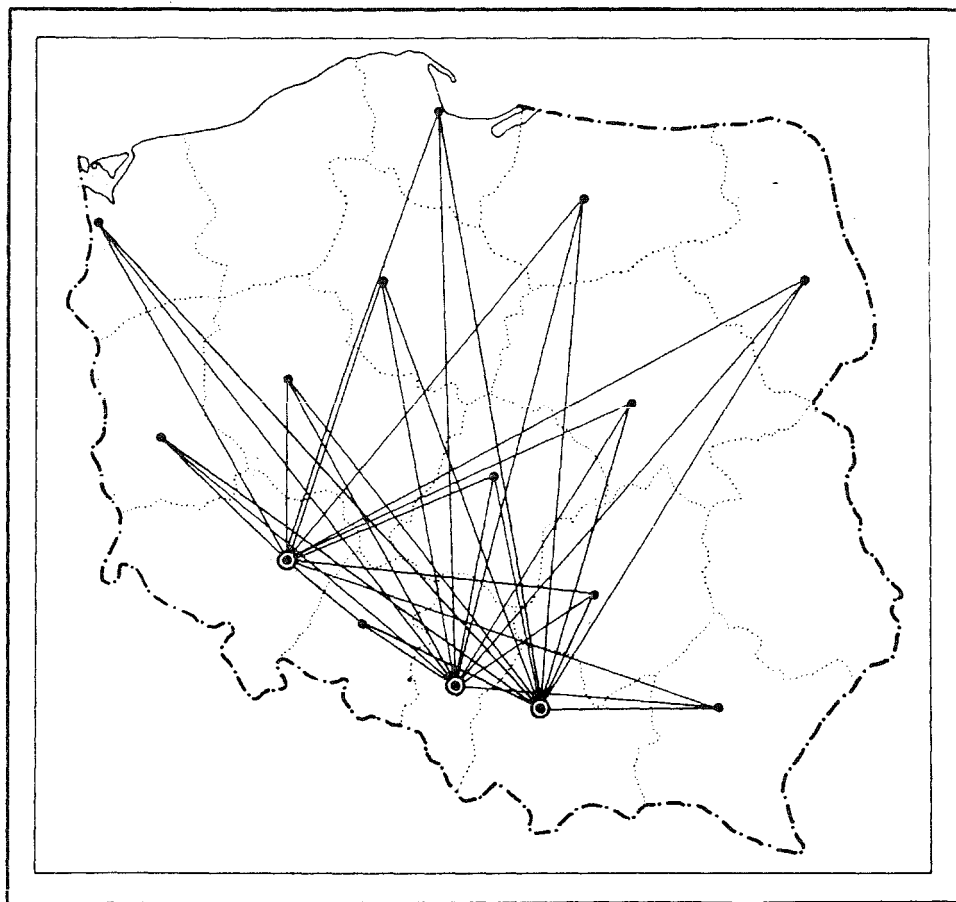


Fig. 3. First-order regional pattern of Poland, 1966.

variance and the second-order pattern, 20%. In spatial context these patterns comprise only West and Central Poland. The first-order pattern is well-developed in 1958. The group of destination-voivodships is compact spatially and contains: Wrocław, Opole, Katowice, Kraków, Kielce, Łódź. Five voivodships: Katowice, Kraków, Wrocław, Opole, Poznań constitute the common origin of goods. This pattern over time changed somewhat, however, we observe changes in the internal structure of this pattern. In 1958 the second-order pattern overlaps with the

first-order pattern. Within this pattern: the Koszalin and Łódź destinations are connected with five sources of goods — Wrocław, Zielona Góra, Szczecin, Poznań and Koszalin. In time sequence this pattern characterizes the tendency to centralization and the restriction of field to northwestern voivodships.

Generally speaking, the two-phase analysis of spatial flows over time appears to provide considerable information concerning the relative stability of regional patterns. Particularly the stability of first-order patterns with

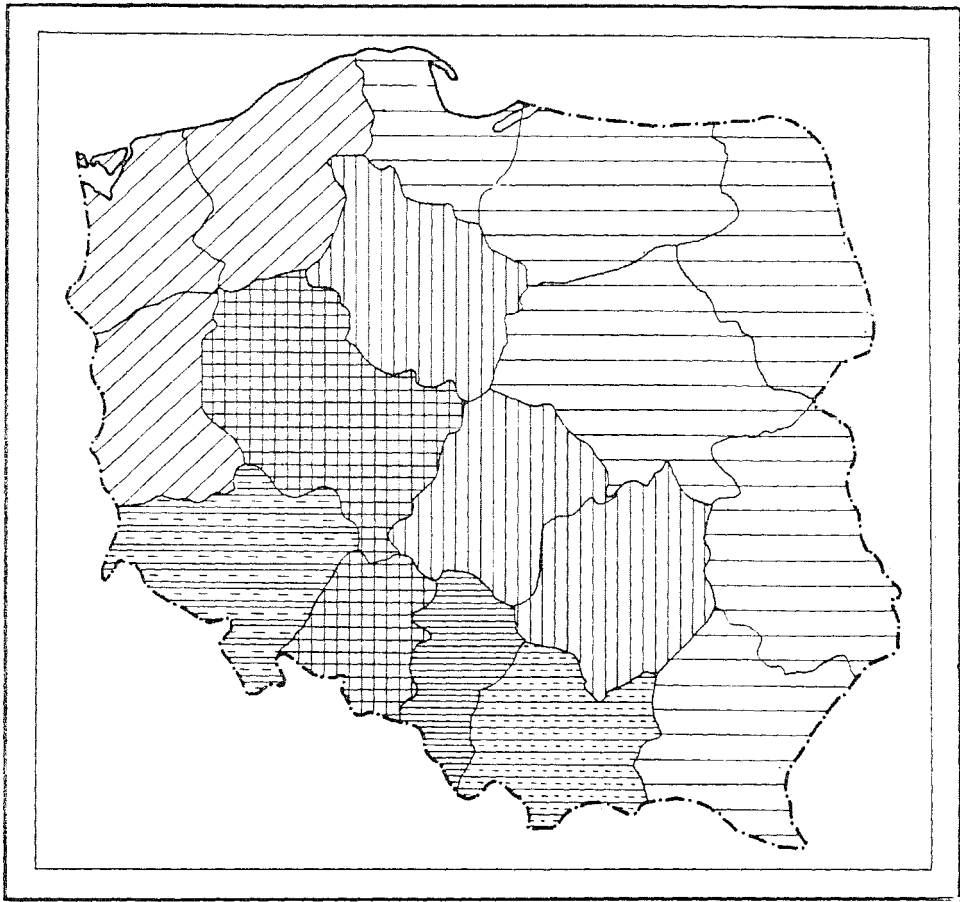


Fig. 4. Groups of destination regions, 1958.

southwestern Poland forming a major origin-focus may be the evidence of long term impact in the national economy.

It must be emphasized that the pictures on interaction structure on the basis of physical and value size are completely different. The patterns resulting from value size flows are spatially poorly developed. On the one hand, it may be evidence of specific character space because orderly larger mobility of value flows leads towards a larger pattern. On the other hand, it may be the result of the high structural complexity of this space and the difficulty of reduction.

The second approach to delimiting functional regional structure is the application of the exhaustive grouping scheme on a set of seventeen voivodships in higher-order regional units. In the context of the problem of the regionalization the factor score matrix designed for the total commodity flow in value volume is used. A 17×17 matrix of distance in two-factorial space was computed. The linkage tree grouping procedure was used. The classification effort tries to produce spatial classes while keeping within-group distance as small as possible and the between-group distance as large as possible.

In this case grouping occurs at the moment of the loss of 10 percent of the detail.

For the purpose of the verification of assumption of spatial order the grouping of voivodships without regard to contiguity and the grouping with a contiguity constraint were required. The typology was being simultaneously the regionalization in 1958. Seven uni-

form regions of Poland in terms of similar outflows were revealed in 1958 (Fig. 4). Some of these regions are single voivodships because they have different economic profiles and therefore specific spatial distributions of outflows.

In 1962 and 1966 non-continuous grouping is always more efficient than contiguous

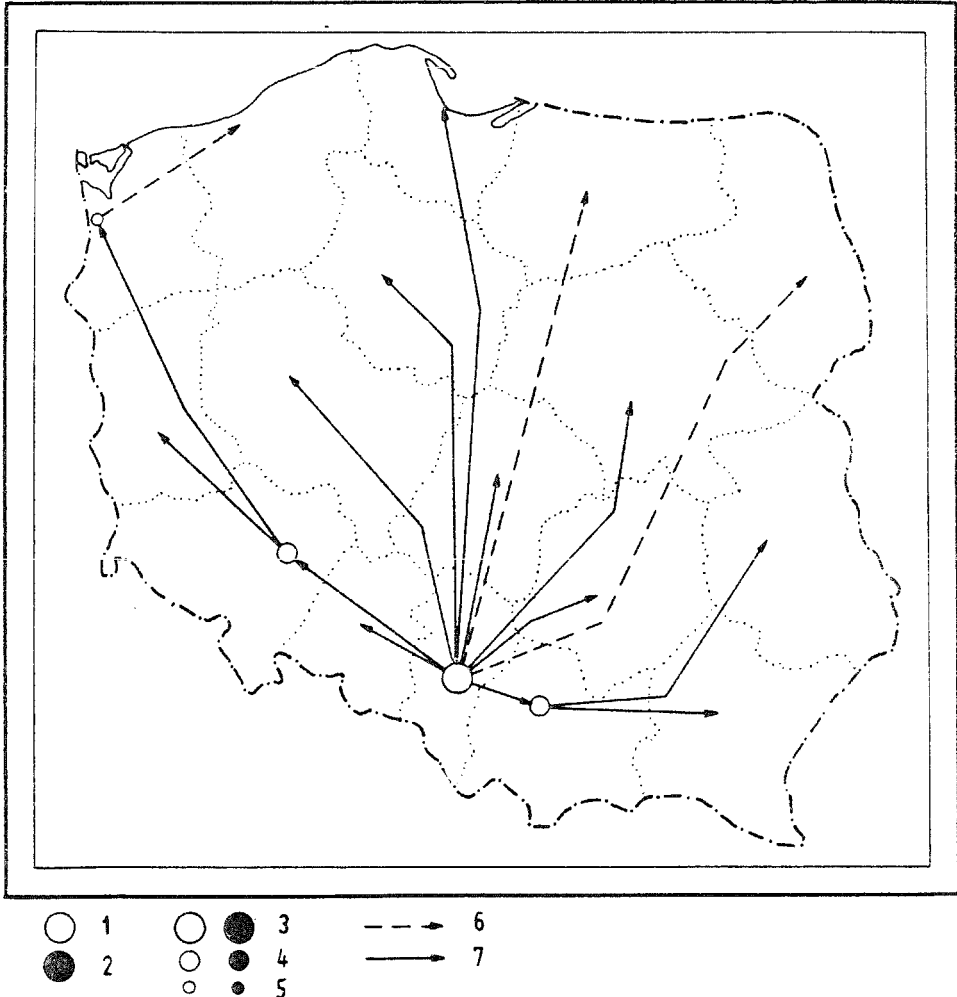


Fig. 5. Factor I. Interregional active connections, 1958.

- 1 - outflow
- 2 - inflow
- 3 - first-order region
- 4 - second-order region
- 5 - third-order region
- 6 - negative factor scores
- 7 - positive factor scores.

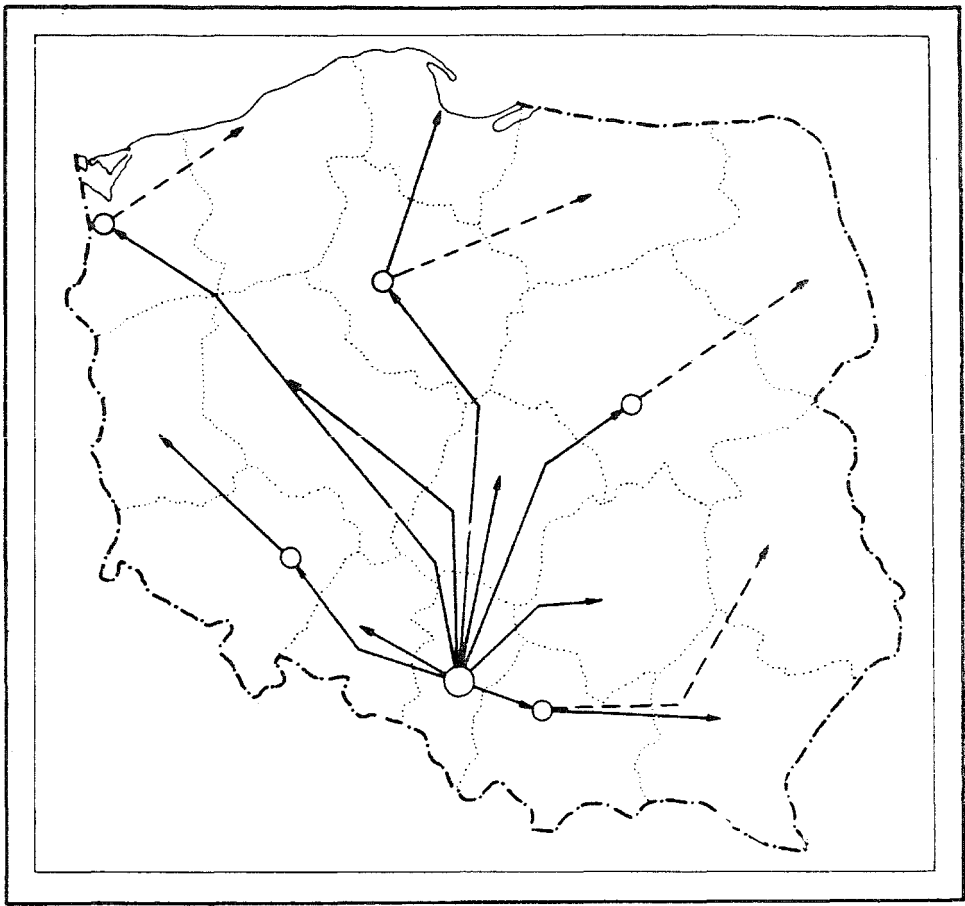


Fig. 6. Factor I. Interregional active connections, 1966.

grouping and gives more classes. An analysis of changes of regional structure over time does not exhibit the distinct tendency to the differentiation or the integration of structure.

The third approach to an analysis of functional regional structure involves two phases. First, the data are placed in a dyadic form matrix and this is subjected to factor analysis. The mathematical procedure starts from an interaction matrix of the type 272×17 in which the $(17^2 - 17)$ possible pairs of voivodship-regions (dyads) occupy the rows and 17 kinds of interaction (commodities) occupy

the columns. Dyads are treated as individual observations. The types of commodity become the variable in this analysis.

In this example, factor analysis carried out by the principal factor method yields the factorial matrices of the type 17×2 for 1958 and 1966, which contain the loadings of two factors in 17 variables. Two factors accounted for 95% of a total common variance in 1958 and 75% in 1966.

In 1958 an underlying two-factor structure was revealed. Factor I accounting for 70.32% of common variance, consist of three groups: (1) raw materials of mineral origin (bitu-

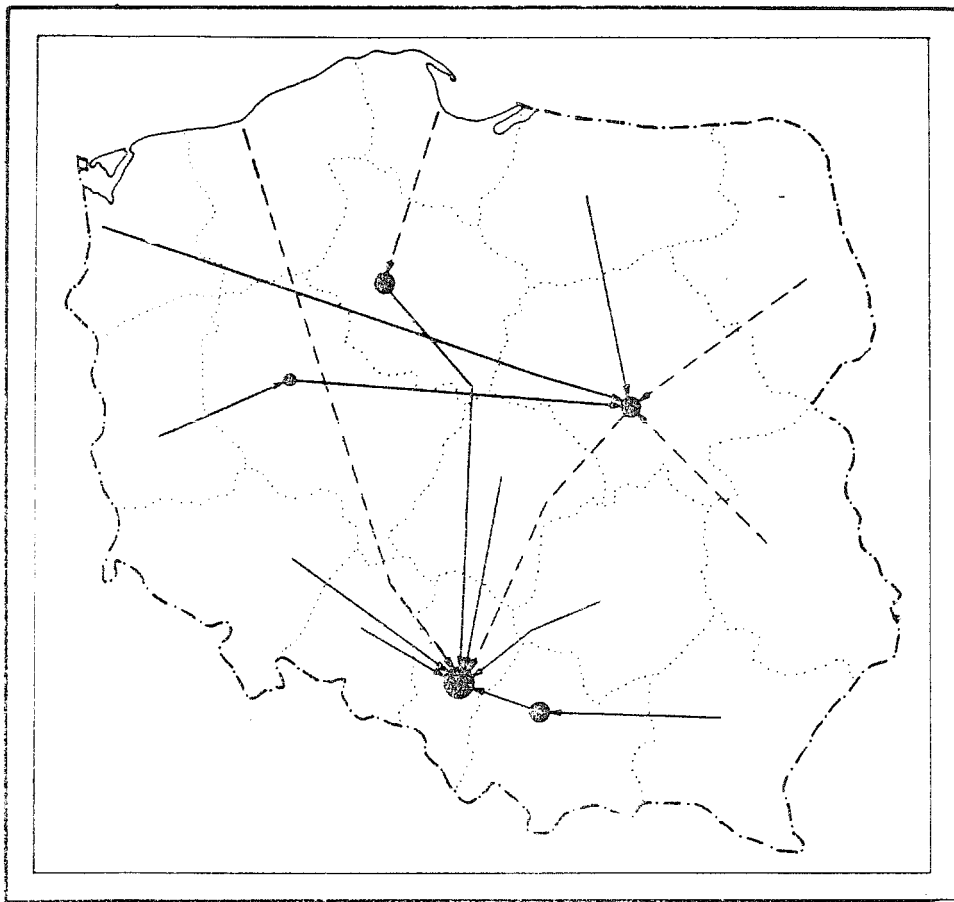


Fig. 7. Factor I. Interregional passive connections, 1958.

minous coal, brown coal and coke, ores, stones, sands and gravels), (2) industrial goods (metals and metal manufactures, bricks, cement, artificial fertilizers, other freight), (3) timber and timber manufactures. Accounting for 25% of communality, Factor II represents agricultural products. Strong loadings are recorded by commodities: grains, potatoes, sugar beets.

In 1966 the situation changed considerably. The identification of factors is not so clear. Factor I explains only 46% of the total common variance of the variables and comprises mainly industrial products and ores

(ores, metals and metal manufactures, chemical products, other freight), agricultural products (grains, sugar beets, other crops and processed agricultural products), timber and timber manufactures. Factor II is based on the loadings by the raw materials for fuel and building "brown coal and coke, stones and bricks". This factor explains about 28% of the communality of variables.

The factor scores for dyads constitute a factor score matrix of the type 272×2 , which was transformed into two matrices for every year (1958 and 1966) of the order 17, which was a starting point for the spatial grouping

which we call the latent structure matrix. Each cell of the matrix corresponds to a different element of interregional exchange, i.e., to a different inter-regional connection. The cells on the main diagonal referring to connect on within each of the particular regions were omitted. In the rows of the matrix for every factor we read outflows in terms of factor scores for the particular regions, i.e., their active connections; whereas in the columns we read the inflows, i.e., passive connections.

The second phase of our analysis is associated with the problem of generalizing the two

basic factors into a system of regional structure over time. The analysis requires the grouping together of voivodships on the basic flows in the terms of dyad factor scores. As the method of grouping dyads for each factor we used the method described by J. D. Nystuen and M. F. Dacey (1961). This method permits the establishment of hierarchical relations between voivodships in two aspects: outflows (active connections) and inflows (passive connections). If the connections in terms of factor scores are ranked according to their magnitudes in the rows and columns, it is possible to determine the dominant and

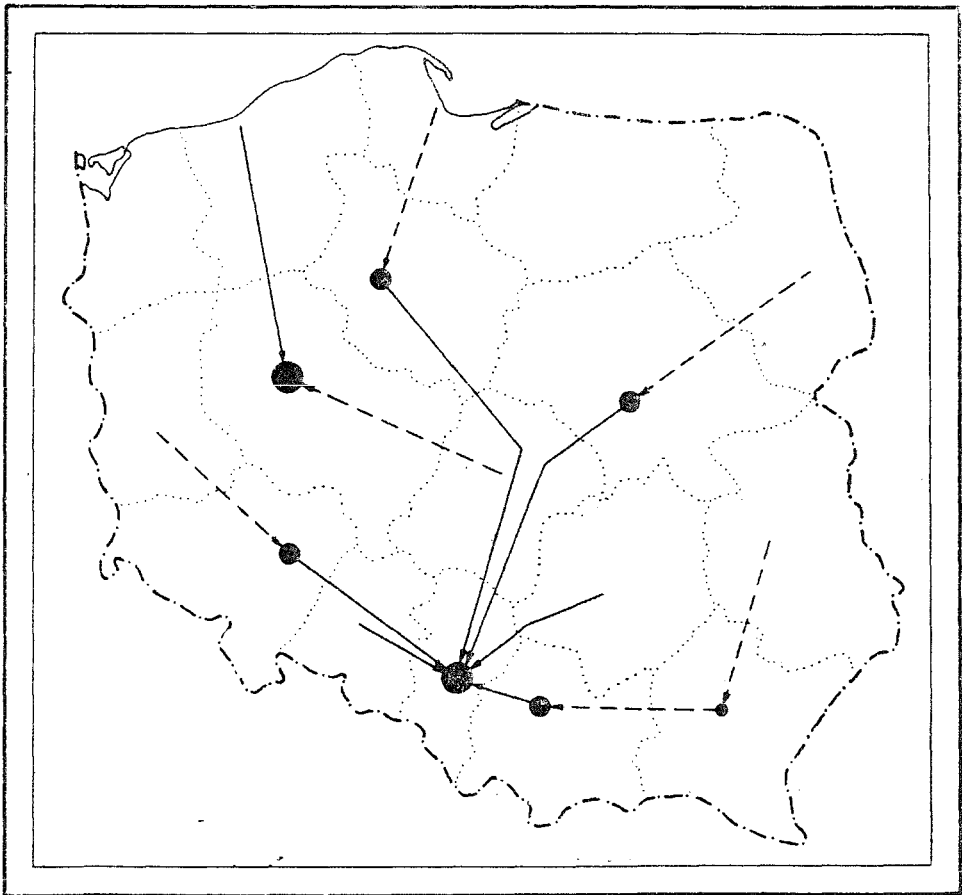


Fig. 8. Factor I. Interregional passive connections, 1966.

subordinate voivodships. A dominant voivodship is one which records its largest flow to lower order voivodship. A subordinate voivodship is one for which the largest flow is to a higher order voivodship.

The main descriptive conclusions concerning regional structure can be drawn from a comparative analysis of changes in time of Factor I, which identified the mining and manufacturing industry (Fig. 5-8).

First of all, whole regional system of the country exhibits the most intensive connections with the Katowice voivodship. The connections with Katowice occupy first place in the interregional flows of all other regions, endowing Katowice with a focal character on the national scale. This defines the role of Katowice (The Upper Silesian Industrial District) as that area upon which are focused the productive-industrial activities of the country, the basic sections of heavy industry: coal-mining, metallurgy, engineering and chemicals. The high degree of its specialization links it with a wide area and, as a result, gives a unity which is the functional basis of its ability for full complex economic development; thus simultaneously it also establishes its own inner coherence. The high intensity of the commodity flows of Katowice, the uniformity of links, the active and passive type of dependence and its character as an open economic region reflect the predominant role played by the raw materials and industry of this region in the structure of the national economy. As a result of its nodal organization, therefore, Katowice can be considered as the focal economic region in the national system with no changes in active connections in time.

Second order pattern is different for active and passive connections. The active connections constitute two regions: the Wrocław and Kraków voivodships, the passive connections — three: the Bydgoszcz, Warszawa

Kraków voivodships. The changes in time in the second-order patterns show the further differentiation and origin of new regional centers: active — the Szczecin, Bydgoszcz, Warszawa voivodships; passive — the Wrocław voivodship.

The system is much more complicated and some subordinated regions are not continuous to their superior regions. This is probably partly attributable, however, to the some changes in the nature of the factor including also agricultural flows.

Factor II in 1958 picks out mainly agricultural patterns. These relations permit one to certain elements for division into the structure of more uniform regional organization. The nature of the second factor is not the same in 1966. This is why we cannot compare the resulting structure in time. In 1966 the second factor identifies the raw materials for fuel and building.

In the analysis of commodity flows for the purpose of organization of regions into a hierarchy it must be emphasized that the different types of connections give varied organization, which is insufficiently integrated to establish the clear functional regional system.

Conclusions

On the basis of our present knowledge the following picture of regional structure of Poland emerges.

Poland at present is one clearly defined separate economic region. Usually independent states form such separate economic regions as a result of their political, economic and social organization. In Poland such factors as, the size of the country, the national similarity and unity, levelling of various classes and regions due to great war and post-war migration and strong internal linkages of economic nature, make its integration into

one economic system much stronger than in other states.

The homogeneous structure of the national economy or differentiation into various types of regional economics and their distribution is characterized in Poland by a wide fragmentation as a result of the historical condition of development. This is due to: (1) the political and economic partitions as a division of Poland among three states and several changes of the state boundaries; (2) the differentiation in the growth of agriculture production and its economic structure; (3) the concentration of the prevailing part of industrial complexes around mineral deposits mainly on coal; (4) an extremely differentiated pattern of urbanization.

The general pattern and typology of regions is based on the discovery of three main factors explaining this pattern. The first one is connected with urbanization and industrialization; the second and the third with population and productive processes in agriculture.

The preceding description of functional relations and the resulting regional structure of Poland is based on the study of inter-regional connections; in this way a clear picture of the whole socio-economic system and its division was obtained. The analysis of commodity flows especially emphasizes the existence of regions of a different order in a hierarchical arrangement of regional structure. This study revealed that Poland is in fact one strongly integrated region with

its economic center in Upper Silesia. Only within such a pattern may some more complicated structures be further distinguished.

References

- Berry B.J.L., 1966: Essays on commodity flows and the spatial structure of the Indian economy. *University of Chicago, Department of Geography, Research Paper 111*, Chicago.
- Chojnicki Z., Czyż T., 1972 a: The socio-economic differentiation of Poland's spatial structure. *Geographia Polonica 24*.
- Chojnicki Z., Czyż T., 1972 b: Zmiany struktury regionalnej Polski w świetle przepływów towarowych w latach 1958 - 1966 [Summary: Changes in the regional structure of Poland based on commodity flows in 1958 - 1966.]. *Studia KPZK PAN*, 40, Warszawa.
- Chojnicki Z., Czyż T., 1973: Structural changes of the economic regions in Poland: a study by factor analysis of commodity flows. *Geographia Polonica 25*.
- Czyż T., 1970: Zastosowanie metody czynnikowej w badaniach przestrzenno-ekonomicznych [Summary: Factor analysis in spatio-economic researches]. *Przegląd Geograficzny*, 42, z. 3.
- Czyż T., 1971: Zastosowanie metody analizy czynnikowej do badania ekonomicznej struktury regionalnej Polski [Summary: The application of factor analysis in the study of Poland's economic regional structure]. *Prace Geograficzne 92*, Wrocław.
- Dziwoński K., Wróbel A., 1964: Regional structure and economic regions of Poland. *Geographia Polonica 4*.
- Nystuen J. D., Dacey M. F., 1961: A graph theory interpretation of nodal regions. *Regional Science Association, Papers and Proceedings 7*.

QUAESTIONES GEOGRAPHICAE

1



POZNAŃ 1974